

## **AMENDMENTS TO THE CLAIMS**

This listing of claims will replace all prior versions, and listings, of claims in the application:

### **Listing of Claims:**

1           1 (Canceled).

1           22. (New) An computer system for solving an interval global optimization  
2 problem specified by a function  $f$  and a set of equality constraints, the computer  
3 system comprising:  
4           a processing unit;  
5           a memory;  
6           an interval arithmetic unit within the processing unit, wherein the interval  
7 arithmetic unit is configured to receive floating-point numbers representing a first  
8 endpoint and a second endpoint for a first interval and floating-point numbers  
9 representing a first endpoint and a second endpoint for a second interval, and is  
10 configured to perform arithmetic operations to produce a first endpoint and a  
11 second endpoint representing a resulting interval;  
12           wherein computational code within the memory is configured to perform  
13 an interval global optimization process to compute guaranteed bounds on a  
14 globally minimum value of the function  $f(\mathbf{x})$  subject to the set of equality  
15 constraints;  
16           wherein the optimizer is configured to,  
17                        apply term consistency to the set of equality constraints  
18                        over a subbox  $\mathbf{X}$ , and to

19                   exclude portions of the subbox **X** that can be shown to  
20                   violate any of the equality constraints.

1           23. (New) The computer-system of claim 22,  
2           wherein the interval arithmetic unit includes a first input, wherein the first  
3           input includes a first floating point number representing a lower bound of the first  
4           input and a second floating point number representing an upper bound of the first  
5           input; and  
6           wherein the interval arithmetic unit includes a second input, wherein the  
7           second input includes a third floating point number representing a lower bound of  
8           the second input and a fourth floating point number representing an upper bound  
9           of the second input.

1           24. (New) The computer-system of claim 22, wherein the optimizer is  
2           configured to:  
3           precondition the set of equality constraints through multiplication by an  
4           approximate inverse matrix **B** to produce a set of preconditioned equality  
5           constraints;  
6           apply term consistency to the set of preconditioned equality constraints  
7           over the subbox **X**; and to  
8           exclude portions of the subbox **X** that can be shown to violate any of the  
9           preconditioned equality constraints.

1           25. (New) The computer-system of claim 22, wherein the optimizer is  
2           configured to:  
3           keep track of a least upper bound  $f\_bar$  of the function  $f(\mathbf{x})$ ;  
4           unconditionally remove from consideration any subbox for which  
5            $\inf(f(\mathbf{x})) > f\_bar$ ;

1           apply term consistency to the inequality  $f(\mathbf{x}) \leq f\_bar$  over the subbox  $\mathbf{X}$ ;  
2   and to  
3           exclude portions of the subbox  $\mathbf{X}$  that violate the inequality.

1           26. (New) The computer-system of claim 22, wherein the optimizer is  
2   configured to:  
3           apply box consistency to the set of equality constraints  $q_i(\mathbf{x}) = 0$  ( $i=1, \dots, r$ )  
4   over the subbox  $\mathbf{X}$ ; and to  
5           exclude portions of the subbox  $\mathbf{X}$  that violate the set of equality  
6   constraints.

1           27. (New) The computer-system of claim 22, wherein the optimizer is  
2   configured to:  
3           evaluate a first termination condition;  
4           wherein the first termination condition is TRUE if a function of the width  
5   of the subbox  $\mathbf{X}$  is less than a pre-specified value,  $\epsilon_X$ , and the absolute value of the  
6   function,  $f$ , over the subbox  $\mathbf{X}$  is less than a pre-specified value,  $\epsilon_F$ ; and to  
7           terminate further splitting of the subbox  $\mathbf{X}$  if the first termination  
8   condition is TRUE

1           28. (New) The computer-system of claim 22, wherein the optimizer is  
2   configured to perform an interval Newton step on the John conditions.